

## **Uncha Mountains Red Hills Provincial Park Grasslands Description and Restoration**

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## **Abstract**

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Grasslands in Uncha Mountain Red Hills Provincial Park in northcentral British Columbia, Canada, have been reduced in size due to encroachment by woody species, especially trembling aspen, but also prickly rose, Saskatoon and snowberry. The remaining grassland areas have more woody species than found in similar grasslands in other locations in the SBSdk subzone. These grasslands are important biologically because of the rarity of the habitat type they provide on the landscape. The significance of these grasslands is reflected in management documents for the park, which recognize the importance of the grasslands and state that prescribed fire will be the primary means of restoration.

In this project, an inventory of all grasslands in the park was conducted, as some of the grasslands in the park were known to be the Red-listed SBSdk/81 Saskatoon – Slender wheatgrass shrub/steppe ecological community, but the vegetation type in other open areas was unknown. Most of the open vegetation areas were confirmed as being SBSdk/81, but Cow Parsnip, Modified Grasslands and Aster Meadows were also identified.

An area of grassland that had been encroached upon by woody species that was suitable for prescribed burning was identified. A site visit with staff from the BC Ministry of Forests and Range, Northwest Fire Centre, confirmed the suitability of this area for burning. A vegetation monitoring plot was established at this location using both Daubenmire quadrats and transects. A vegetation management prescription prescribing a burn was written for a four hectare area covering part of the monitoring plot. A burn plan is being written in conjunction with BC Ministry of Forests and Range, Northwest Fire Centre.

The success of the burn will be monitored by remeasuring the monitoring plot, mapping burn severity over burnt areas and measuring the proportion of aspen trees killed by the burn. Additional burns will likely be required to destroy the suckers that will be produced from the roots of the killed trees.

## **Acknowledgements**

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## 1.0 Introduction

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Grasslands in many parts of British Columbia have been encroached upon by tree species, especially Douglas-fir, lodgepole pine and trembling aspen<sup>1</sup>. Uncha Mountain Red Hills Provincial Park in northwest British Columbia, Canada, contains some of these grasslands that are diminishing in size due to trembling aspen encroachment (de Groot and Armitage 2007). Grasslands in the northwest portion of British Columbia are known to be important biologically on the landscape due to the rarity of the habitat they provide for plant and animal species (Haeussler 2007). Reversing encroachment on grasslands by aspen and other woody species including lodgepole pine, snowberry, common juniper and prickly rose is not an easy process due to the growth response of some of these species to damage such as burning and cutting.

Planning documents for Uncha Mountain Red Hills Park provide clear direction that the grasslands type is an important ecosystem in the park. Also, these plans state that fire will be the primary means of restoring natural grasslands in the park, perhaps in association with mechanical treatments (Government of British Columbia 2000, Ministry of Water, Land and Air Protection 2003).

Some of the grasslands in Uncha Mountain Red Hills Park have been identified as the Red-listed ecological community SBSdk/81 Saskatoon – Slender wheatgrass shrub/steppe (Banner *et al.* 1993, Ministry of Water, Land and Air Protection 2003, de Groot and Armitage 2007). Vegetation types occupying non-forested areas in the park are not all known. An inventory of these vegetation types, along with descriptions of their suitability and requirements for restoration, was needed to direct restoration efforts (de Groot and Armitage 2007).

The purpose of this project was to implement the recommendations in de Groot and Armitage (2007) regarding the grasslands in the park. The project included:

- providing detailed descriptions of the grasslands in the park including current conditions and suitability for restoration,
- establishing a reference plot in an area suitable for restoration for monitoring purposes, and
- writing a burn plan for an area identified for restoration.

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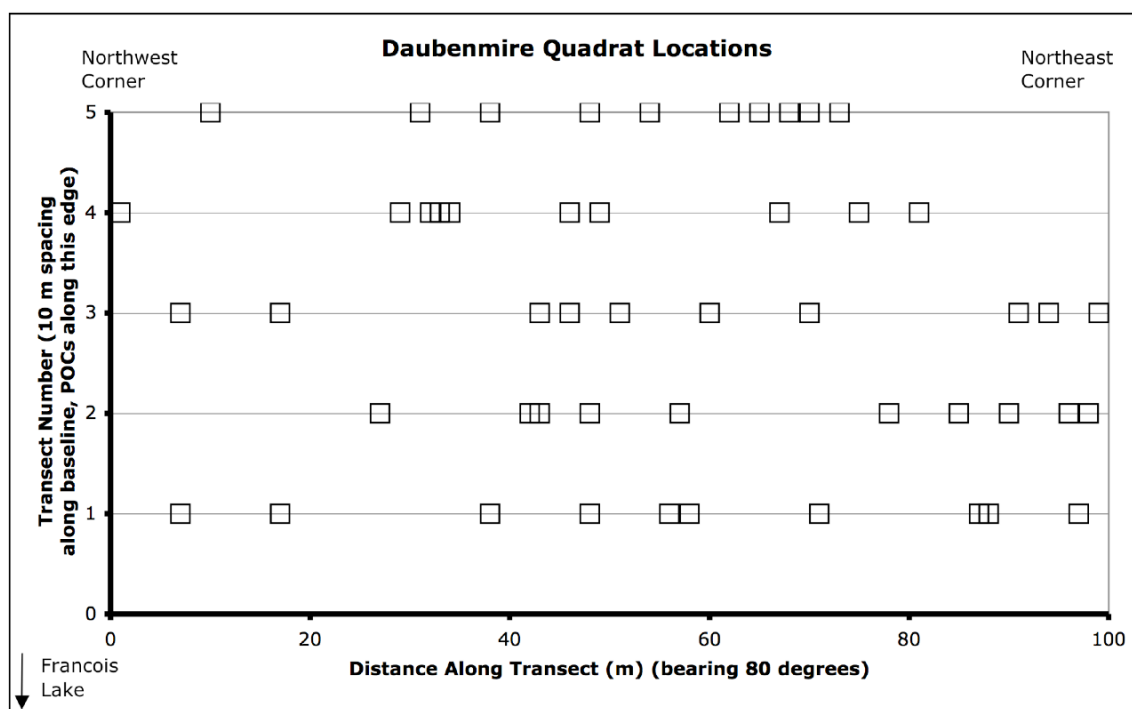
<sup>1</sup> Scientific names of all plant species are provided in Table 4

## 2.0 Methods

Most of the grasslands identified in de Groot and Armitage (2007) were visited, described using methods in the Field Manual for Describing Terrestrial Ecosystems and FS882 Ecosystem Field Form (Ministry of Environment and Ministry of Forests 1998), and visually assessed for their need for restoration and their suitability for burning. These grasslands were initially mapped as grasslands by the Grasslands Conservation Council of BC (2004) using the Open Range label on BC Ministry of Forests and Range forest cover maps. Some polygons labelled Rock appeared to be similar to those labelled Open Range, so investigations of these polygons were made to determine if they were also best classified as Grassland.

Vegetation monitoring transects were placed in an area that was determined to be in need of prescribed burning due to encroachment of open areas by woody species, adjacency to an existing grassland, and presence of adequate fuels to carry a fire. A visit to this area was made with Dr. Sybille Haeussler and three personnel from the Northwest Fire Centre and the Nadina Fire Zone – Ian Meier, Rob Krause and Jean Walters. The fire personnel felt that the fuel loading was sufficient to carry a burn through parts of the area in the spring without any preparation of the fuels.

Vegetation monitoring transects were placed following methods in Gayton (2003) and Veenstra and McLennan (2002). Five 100 m long transects set 10 m apart were established numbered from downhill to uphill (Figure 1 and Table 1). The vegetation was described in two ways: (1) in 100 m long line transects and (2) in 10 randomly placed Daubenmire quadrats (50 cm x 20 cm) along each transect (Figure 1 and Table 2).



**Figure 1.** Layout of monitoring plot transects and quadrats

**Table 1.** UTM coordinates of corners of vegetation monitoring plot

Location	UTM Zone	Easting	Northing
NW corner	10 U	329650	5991130
SW corner	10 U	329663	5991092
SE corner	10 U	329749	5991100
NE corner	10 U	329733	5991141

**Table 2.** Placement of Daubenmire quadrats along transects

<b>Transect #</b>	<b>Metres from Baseline</b>									
1	7	17	38	48	56	58	71	87	88	97
2	27	42	43	48	57	78	85	90	96	98
3	7	17	43	46	51	60	70	91	94	99
4	1	29	32	33	34	46	49	67	75	81
5	10	31	38	48	54	62	65	68	70	73

Along transects, any tree or shrub that intersected the tape was recorded along with the start and stop locations of the interception. In quadrats, all species that occurred in a quadrat were recorded, and the percent cover of each species was visually estimated.

Transects run west to east at a bearing of 80° with the Point of Commencement (POC) on the west end and Point of Termination (POT) of on the east end. Points of Commencement and POT's are 18-inch long rebar stakes painted pink and flagged with pink ribbon. Daubenmires are marked with two six-inch nails along the transect line and flagged with orange ribbon.

The mapped layout of the monitoring plot using Global Positioning System (GPS) coordinates taken at the four corners is not quite square or as large as the ground layout. This is likely due to error in the GPS readings.



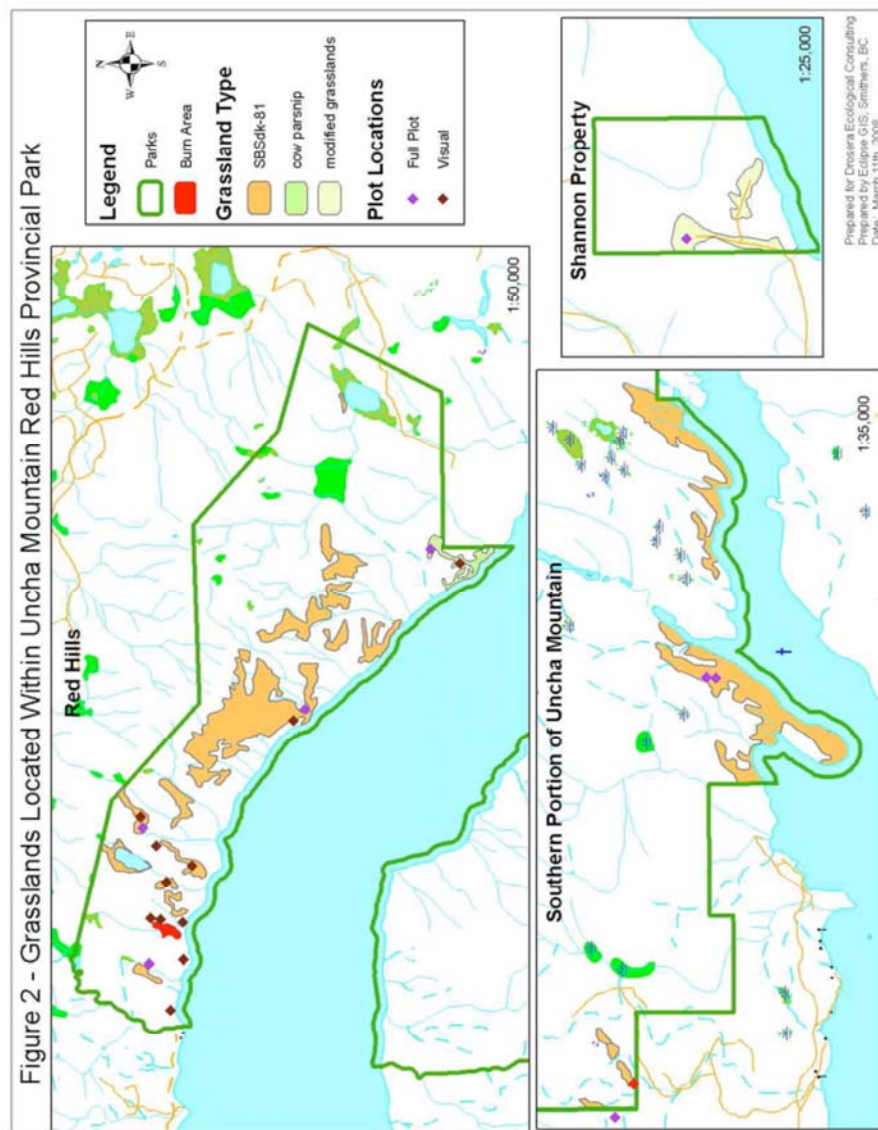
### 3.0 Results

#### 3.1 Grassland Descriptions

The existing mapped grasslands and the polygons labelled Rock on forest cover maps in the park were manually classified into four vegetation types: SBSdk81, Cow Parsnip, Modified Grassland and Aster Meadow (Figure 2) – each is described below. The SBSdk/81 occupies the majority of the grassland area, with the Aster Meadow not mapped as a separate unit due to its small size (Table 3).

**Table 3.** Area in each grassland type

Community type	Polygons	Area (ha.)
SBSdk/81	19	246
Cow Parsnip	1	12
Modified Grassland	2	9
Total	22	268



**Figure 2.** Grassland located within Uncha Mountain Red Hills Park

### 3.1.1 SBSdk/81 - Saskatoon – Slender wheatgrass Shrub/steppe

The majority of the areas visited were classified as SBSdk/81 – Saskatoon – Slender wheatgrass shrub/steppe (Banner et al. 1993), and this is the most common non-forested vegetation type in the park. Five plots were placed in this vegetation type. This community is found on steep (43-70% slope) colluvial veneers and blankets in the mid to upper slope position (Figure 3). The soils were usually thin Orthic Melanic or Eutric Brunisols with a sandy loam to loam texture. The humus forms were mostly rhizomull with one vermimull. The soil moisture regime was xeric to subxeric and the soil nutrient regime was medium to rich (1-2/C-D).

Kinnikinnick was more prominent than commonly found on the SBSdk/81 in the SBSdk, but the site and other vegetation features are consistent with the SBSdk/81 classification (Table 4). Saskatoon, 30 - 40 cm tall, was co-dominant with kinnikinnick on the sites (Figure 4 and Figure 5). Lodgepole pine, interior spruce and trembling aspen were occasionally present, and Douglas-fir was adjacent to one plot on the eastern edge of the Red Hills. Other shrubs included common juniper, snowberry, red-osier dogwood, prickly rose, pin cherry, and Rocky Mountain juniper. Prominent herb species included northern bedstraw, spreading needlegrass, yarrow, self heal, and false Solomon's seal. Other herb species included purple peavine, American vetch, wild strawberry, slender wheatgrass, field chickweed and *Bromus* spp. Similar examples of SBSdk/81 are found 90 km to the southeast above the Euchariniko River (Simonar and Migabo 2004).

The SBSdk/81 in the park is generally in excellent condition in terms of the lack of exotic plant species; however, in terms of woody species encroachment the condition is sub-optimal, with the cover of late seral grasses low and the cover of woody species high. Encroachment by woody species, especially trembling aspen, common juniper and prickly rose, is occurring, particularly in areas that are slightly moister. Encroachment by lodgepole pine and Interior spruce is occurring at the top of the slopes, but to a much lesser degree. Cattle grazing is minimal due to the steep rocky slopes. Damage to trembling aspen from the heavy snowfall in the winter of 2006/2007 (Figure 4) may induce suckering around the perimeter of some openings (Peltzer and Wilson 2006).



**Figure 3.** Overview of typical terrain containing SBSdk/81 in the Red Hills portion of park.



**Figure 4.** Typical SBSdk/81 in the southwest corner of the Uncha Mountain portion of park



**Figure 5.** Typical SBSdk/81 in the Red Hills portion of park

**Table 4.** Species composition of ecosystem plots from open vegetation types in Uncha Mountain Red Hills Park

Species		Growth form	SBSdk/81		Cow parsnip	Modified grassland	Aster
Common name	Latin name		# of plots	Average percent cover			
Saskatoon	<i>Amelanchier alnifolia</i>	Woody	5	56	0.1		
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	Dwarf shrub	5	30			
Common juniper	<i>Juniperus communis</i>	Woody	4	14			
Lodgepole pine	<i>Pinus contorta</i>	Woody	2	12			
Red-osier dogwood	<i>Cornus stolonifera</i>	Woody	2	10			
Northern bedstraw	<i>Galium boreale</i>	Forb	4	9	1	5	2
Spreading needlegrass	<i>Achnatheum richardsonii</i>	Graminoid	4	7			1
False Solomon's seal	<i>Maianthemum racemosum</i>	Forb	2	5			5
Interior spruce	<i>Picea glauca x engelmannii</i>	Woody	1	4			20
Snowberry	<i>Symphoricarpos albus</i>	Woody	3	4	2	1	60
Trembling aspen	<i>Populus tremuloides</i>	Woody	2	3			60
Yarrow	<i>Achillea millifolia</i>	Forb	5	3	3	10	1
American vetch	<i>Vicia americana</i>	Forb	4	2	15	5	
Pasture sage	<i>Artemisia frigida</i>	Forb	1	2			
Pin cherry	<i>Prunus pensylvanica</i>	Woody	2	2			
Prickly rose	<i>Rosa acicularis</i>	Woody	3	2		0.5	5
Purple peavine	<i>Lathyrus nevadensis</i>		4	2	5	3	20
Rocky Mountain juniper	<i>Juniperus scopulorum</i>	Woody	1	2			40
Self-heal	<i>Prunella vulgaris</i>	Forb	2	2			2
Western groundsel	<i>Senecio integerrimus</i>	Forb	1	2			
Birch-leaved spirea	<i>Spiraea betulifolia</i>	Woody	2	1			
Brome**	<i>Bromus spp.</i>	Graminoid	3	1	75	50	50
Field chickweed	<i>Cerastium arvense</i>	Forb	3	1			
Fragile fern	<i>Cystopteris fragilis</i>	Forb	2	1			
Slender wheatgrass	<i>Elymus trachycaulus</i>	Graminoid	4	1			
Sticky cinquefoil	<i>Potentilla glandulosa</i>	Forb	3	1			
Stiff needlegrass	<i>Achnatherum occidentale</i>	Graminoid	1	1			
Wild strawberry	<i>Fragaria virginiana</i>	Forb	4	1	0.1		
Field pussytoes	<i>Antennaria neglecta</i>	Forb	1	0.5			
Kentucky bluegrass*	<i>Poa pratensis</i>	Graminoid	3	0.5	15	15	
Lance-leaved stonecrop	<i>Sedum lanceolatum</i>	Forb	3	0.5			
Nodding onion	<i>Allium cernuum</i>	Forb	3	0.5			
Ross' sedge	<i>Carex rossi</i>	Graminoid	2	0.5			
Common red paintbrush	<i>Castilleja miniata</i>	Forb	1	0.1	1		4
Creamy peavine	<i>Lathyrus ochroleucus</i>	Forb	1	0.1			
Cut-leaf anemone	<i>Anemone multifida</i>	Forb	4	0.1			
Hay sedge	<i>Carex siccata</i>	Graminoid	1	0.1	3		
Holboell's rockcross	<i>Arabis holboellii</i>	Forb	2	0.1			

Species		Growth form	SBSdk/81		Cow parsnip	Modified grassland	Aster
Common name	Latin name		# of plots	Average percent cover			
Narrow-leaved collomia	<i>Collomia linearis</i>	Forb	3	0.1			
Narrow-leaved hawkweed	<i>Hieracium umbellatum</i>	Forb	1	0.1			
Orange agoseris	<i>Agoseris aurantiaca</i>	Forb	2	0.1			
Racemose pussytoes	<i>Antennaria racemosa</i>	Forb	1	0.1			
Little buttercup	<i>Ranunculus uncinatus</i>	Forb	1	0.05		4	
Oregon woodsia	<i>Woodsia oregana</i>	Forb	1	0.05			
Western meadowrue	<i>Thalictrum occidentale</i>	Forb	1	0.05	5		5
Showy pussytoes	<i>Antennaria pulcherrima</i>	Forb	1	0.01			
Small-flowered blue-eyed Mary	<i>Collinsia parviflora</i>	Forb	1	0.01			
Cow parsnip	<i>Heracleum maximum</i>	Forb			35		
Fireweed	<i>Epilobium angustifolium</i>	Forb			20		
Common dandelion*	<i>Taraxacum officinale</i>	Forb			20	45	
Showy aster	<i>Aster conspicuous</i>	Forb			2	0.5	70
Epilobium	<i>Epilobium spp.</i>	Forb			2		
Woods draba	<i>Draba nemorosa</i>	Forb				2	
Willow	<i>Salix spp.</i>	Woody			0.1		
Canada violet	<i>Viola canadensis</i>	Forb			0.1		
Sedge	<i>Carex spp.</i>	Graminoid				0.1	
Timothy*	<i>Phleum pratense</i>	Graminoid				0.5	
Thimbleberry	<i>Rubus parviflorus</i>	Woody					1

a - these three vegetation types only had one plot each

\* - indicates an exotic species

\*\* - likely includes both native and exotic species of brome

### 3.1.2 Cow Parsnip Community

Cow Parsnip vegetation occurs in several locations in the Red Hills where there is adequate moisture and rich soils (Figure 6); one plot was placed in this community type. The site was located in a mid-slope position, with a 10% slope. The lush herbaceous vegetation was dominated by *Bromus* spp, cow parsnip, fireweed and dandelion. Kentucky bluegrass, American vetch, purple peavine, western meadowrue and yarrow were also prominent. Soils were silty loam Orthic Melanic Brunisols. The organic horizon was rhizomull. The parent material was fluvial with a coarse fragment content of 1-5% rounded gravels and cobbles. The soil moisture regime was subhygric to mesic and the soil nutrient regime was rich (4-5/D). These sites are analogous to the Cow Parsnip sites described by Haeussler (1998). These sites are in good condition and did not appear to be recently grazed. Damage to the trembling aspen from the heavy snowfall in the winter of 2006/2007 may induce suckering around the perimeter of the openings (Peltzer and Wilson 2006).



**Figure 6.** Cow parsnip community in eastern part of Red Hills portion of park

### **3.1.3 Modified Grassland Community**

Modified Grasslands that presently do not resemble natural grasslands occur in the Shannon Property portion of Uncha Mountain Red Hills Park, though it is a natural opening (Figure 7). This area has a long history of grazing and may have been oversown by naturalized grasses. Soils were Orthic Melanic Brunisols with a loamy to sandy loam texture. The humus type was rhizomull. The soil moisture regime was submesic and the soil nutrient regime was rich (3/D). Bromus spp, dandelion, Kentucky bluegrass and yarrow dominate the vegetation. Shrub cover was very low with occasional snowberry and prickly rose plants. The area is grazed by cattle, with many cow trails visible. No restoration efforts are recommended for this area due to degree of change that has occurred to the vegetation community. This area may have been the Red-listed SBSdk/82 Bluegrass - Slender wheatgrass site series before modification. Encroachment of the grassland is likely to continue, and may increase because many of the aspen surrounding the openings were damaged in the winter of 2006/2007 from a heavy snow load; this damage may induce the aspen to produce suckers (Peltzer and Wilson 2006).



**Figure 7.** Modified grassland community in Shannon Property portion of park

#### **3.1.4 Aster Meadow Community**

One plot was placed in a higher elevation lush Aster Meadow between forest downslope and SBSdk/81 upslope. Soils were Orthic Eutric Brunisols with a silty clay loam texture. The humus form was mullmoder. The soil moisture regime was submesic to mesic and the soil nutrient regime was rich (2-3/D). The parent material was morainal with 2-10% angular gravel coarse fragments. The slope was 48%. Showy aster, snowberry, Rocky Mountain juniper, trembling aspen, and purple peavine dominated the meadow. Also prominent were western meadowrue, false Solomon's seal, common red paintbrush and prickly rose. This site is in excellent condition and does not appear to be grazed. The recorded forest cover may be higher than that of the whole site as we were sheltering under trees from a large thunderstorm while doing the plot.

#### **3.2 Monitoring Plot**

The monitoring plot covers 0.36 ha. Vegetation litter dominated the substrate of the monitoring plot area, with minor amounts of rock, wood, bare soil and dung (Table 5). Kinnikinnick, Saskatoon and prickly rose dominated the vegetation in the quadrats, both in terms of the most cover and number of plots in which they occurred. Other species that frequently occurred included purple peavine, birch-leaved spirea, wild strawberry, spreading dogbane, showy aster and yarrow.

Along the transects, where only trees and shrubs were recorded, kinnikinnick, Saskatoon and aspen were dominant (Table 6). Other species that were prominent were prickly rose, pine, birch-leaved spirea, Interior spruce and common juniper. Many aspen trees on the east side of the plot sustained broken tops and branches from the heavy snow load in the winter of 2006/2007, creating a lot of coarse woody debris. There were a few wildlife trails running through the plot and garter snakes were found sunning in the southwest corner.

**Table 5.** Summary of substrate and species cover in Daubenmire quadrats

Substrate		Average % cover per plot	% of plots occurring in
Litter		93	
Rock		3	
Coarse woody debris		3	
Bare soil		1	
Dung		0.1	
Species		Growth form	
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	Dwarf Shrub	24
Saskatoon	<i>Amelanchier alnifolia</i>	Woody	11
Prickly rose	<i>Rosa acicularis</i>	Woody	6
Spreading dogbane	<i>Apocynum androsaemifolium</i>	Forb	4
Showy aster	<i>Aster conspicuous</i>	Forb	3
Purple peavine	<i>Lathyrus nevadensis</i>	Forb	3
Birch-leaved spirea	<i>Spiraea betulifolia</i>	Woody	3
Trembling aspen	<i>Populus tremuloides</i>	Woody	2
Common juniper	<i>Juniperus communis</i>	Woody	2
Creeping juniper	<i>Juniperus horizontalis</i>	Woody	1
Northern bedstraw	<i>Galium boreale</i>	Forb	1
Western meadowrue	<i>Thalictrum occidentale</i>	Forb	1
Wild strawberry	<i>Fragaria virginiana</i>	Forb	1
Yarrow	<i>Achillea millifolia</i>	Forb	1
Fringed aster	<i>Aster ciliolatus</i>	Forb	0.5
Rough-fruited fairybells	<i>Disporum trachycarpum</i>	Forb	0.5
Slender wheatgrass	<i>Elymus trachycaulus</i>	Graminoid	0.5
Willow	<i>Salix spp.</i>	Woody	0.5
Blue clematis	<i>Clematis occidentalis</i>	Forb	0.2
Brachythecium salebrosum		Moss	0.2
Cut-leaf anemone	<i>Anemone multifida</i>	Forb	0.2
False Solomon's-seal	<i>Maianthemum racemosum</i>	Forb	0.2
Snowberry	<i>Symphoricarpos albus</i>	Woody	0.2
Brachythecium	<i>Brachythecium spp.</i>	Moss	0.1
Choke cherry	<i>Prunus virginiana</i>	Woody	0.1
Early blue violet	<i>Viola aduca</i>	Forb	0.1
Fringed brome	<i>Bromus ciliatus</i>	Graminoid	0.1
Mountain arnica	<i>Arnica latifolia</i>	Forb	0.1
Narrow-leaved hawkweed	<i>Hieracium umbellatum</i>	Forb	0.1
Pelt lichens	<i>Peltigera spp.</i>	Lichen	0.1
Short-awned ricegrass	<i>Oryzopsis pungens</i>	Graminoid	0.1
Heart-leaved arnica	<i>Arnica cordifolia</i>	Forb	0.05
Canada violet	<i>Viola canadensis</i>	Forb	0.01
Cladonia	<i>Cladonia spp.</i>	Lichen	0.01
Knight's plume moss	<i>Ptilium crista-castrensis</i>	Moss	0.01
Rocky Mountain fescue	<i>Festuca saximontana</i>	Graminoid	0.01
Ross' sedge	<i>Carex rossi</i>	Graminoid	0.01
Sarsaparilla	<i>Aralia nudicaulis</i>	Forb	0.01
Western fescue	<i>Festuca occidentalis</i>	Graminoid	0.01
Average # of species per quadrat			8



**Table 6.** Summary of species cover along transects

Species		% Cover by transect					Average
		1	2	3	4	5	
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	28	65	31	42	44	42
Saskatoon	<i>Amelanchier alnifolia</i>	40	35	32	38	37	36
Aspen	<i>Populus tremuloides</i>	27	37	37	33	24	31
Prickly rose	<i>Rosa acicularis</i>	16	11	6	10	6	10
Lodgepole pine	<i>Pinus contorta</i>	8	7	4	0	9	6
Birch-leaved spirea	<i>Spiraea betulifolia</i>	3	6	1	3	2	3
Interior spruce	<i>Picea glauca x engelmannii</i>	7	2	2	0	0	2
Common juniper	<i>Juniperus communis</i>	1	1	1	8	1	2
Birch	<i>Betula papyrifera</i>	0	4	1	0	1	1
Willow	<i>Salix</i> app.	1	5	0	0	0	1
Snowberry	<i>Symphoricarpos albus</i>	1	0.1	1	0.1	0.1	0.1
Creeping juniper	<i>Juniperus horizontalis</i>	2	0	0	0	0	0.1
Soopolallie	<i>Shepherdia canadensis</i>	0.1	0	0	0.1	0	0.1

To aid in setting targets for restoration efforts in the SBSdk/81 site series, a comparison was made between cover of growth forms found in this area to that found in sixteen SBSdk/81 plots in the provincial Biogeoclimatic Ecosystem Classification (BEC) database (Table 7). Also included in the comparison were six plots from a preliminary unit called Aspen - Saskatoon - Kinnikinnick from a draft classification revision (Will MacKenzie, Research Ecologist, Ministry of Forests and Range, *pers. comm.*). While the data collection methods differ between this project and the BEC database, it is clear from this comparison that the cover of woody species is much higher in the project area than in these other areas and that the cover of forbs and graminoids is much lower.

**Table 7.** Comparison between percent cover of different growth forms in plots from this project and the BEC database

Growth form	This project mean cover Transects / Daubenmire <sup>a</sup>	BEC database mean cover	
		SBSdk/81	At - Saskatoon - Kinnikinnick
Woody <sup>b</sup>	92	53	63
Forb	16	26	37
Graminoid	0.8	34	20
Dwarf shrub <sup>c</sup>	24	2	16
Moss/lichen	0.5	4	12

a – woody data from transects, all other data from Daubenmire quadrats

b – includes shrubs and trees

c – includes kinnikinnick

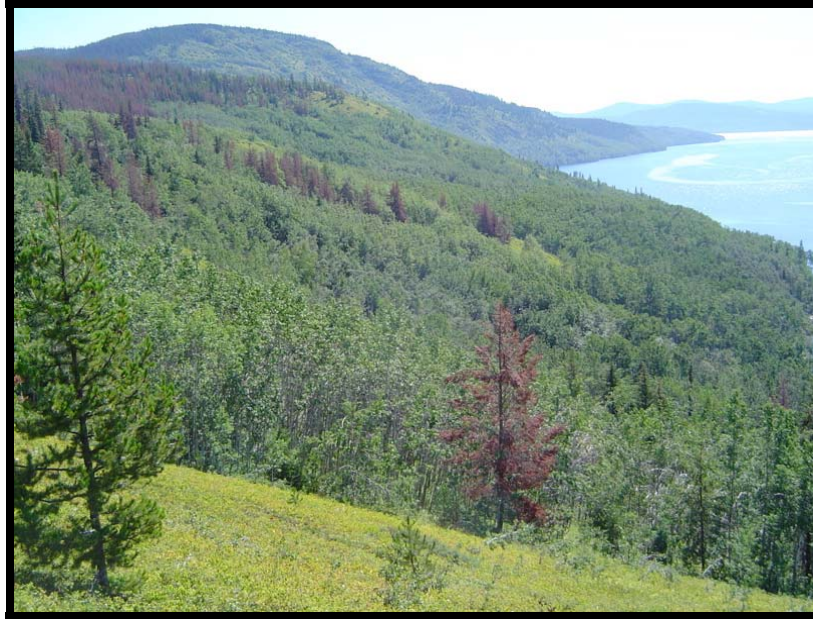
### 3.3 Restoration Recommendations

Of the SBSdk/81 areas visited, those in the Uncha Mountain portion of the park do not require restoration due to the generally low levels of encroachment of aspen. These areas are in good condition with little impact from grazing. The grasslands in the Red Hills portion of the park have seen more encroachment by aspen and to a lesser extent by lodgepole pine. Most of the areas visited, however, would be difficult to burn due to the low fuel loads. Much manual work to cut shrubs and small trees would be required to increase fuel loads to level that might carry a fire. During the field visit with staff of the Northwest Fire Centre one area was identified as having sufficient fuel loading to carry a fire (Figure 8). A vegetation management prescription was drawn up for this area, which called for a prescribed fire (Appendix 1). Not all encroached areas were visited, so additional areas suitable for burning may be present.

The effect of burning severity on the number of suckers produced by aspen trees is not clear. AMEC (2002) reported that light burns produce fewer suckers than moderate to severe burns, but this is not supported by Wang (2003) who found that sucker production decreased as burn severity increased. Wang (2003) also found that regardless of burn severity, after three years the number of suckers was similar due to the death of many suckers, but the suckers were

larger and thicker on most lightly burnt sites. Hotter fires are more likely to kill aspen roots on shallow soil sites (Howard 1996). This is corroborated by local experience (Veenstra and Haeussler 2002).

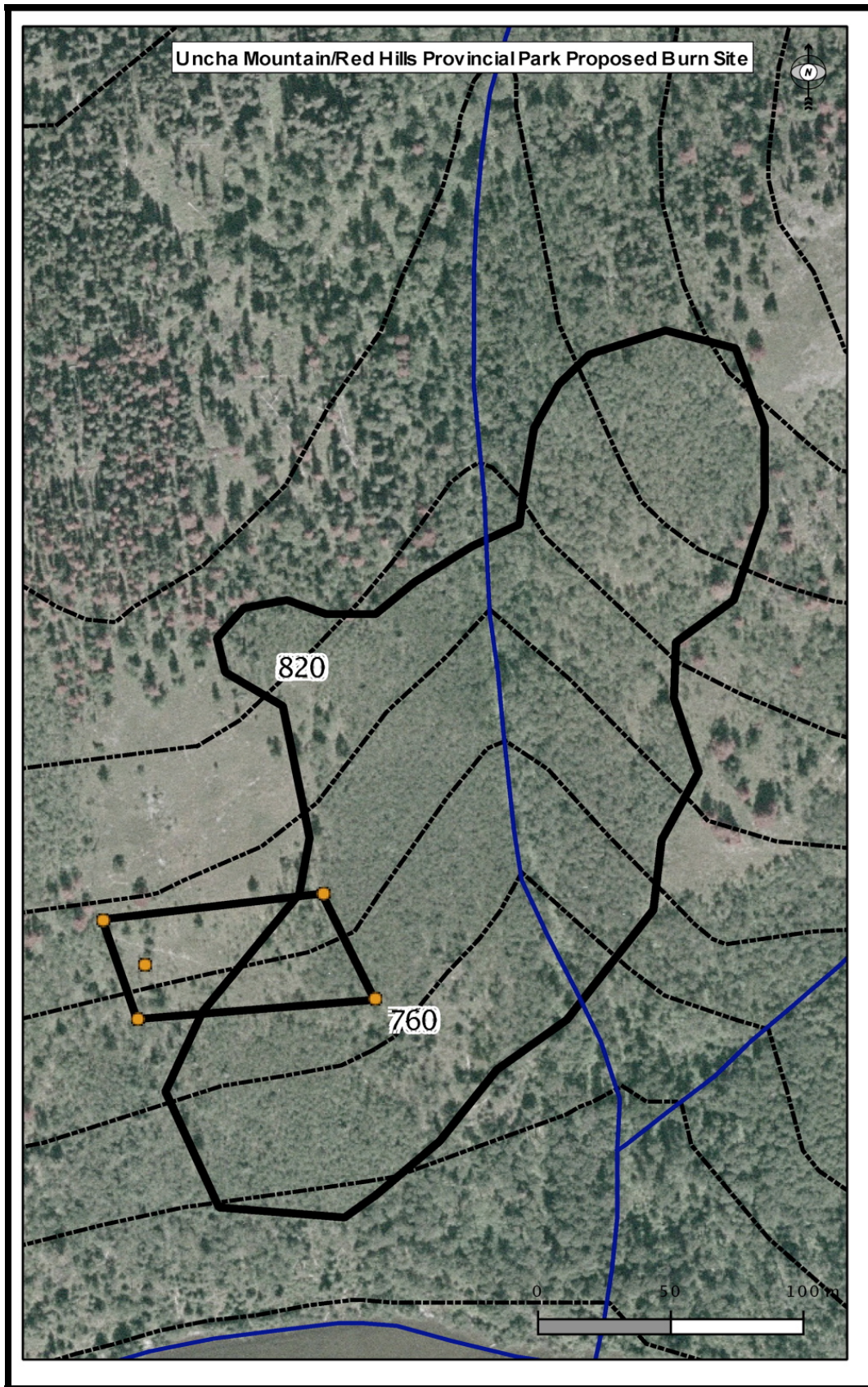
The severity of the proposed burn and vegetation response in terms of aspen survival, suckering response, and response of other vegetation in the plot will be monitored. Monitoring will be used to plan future restoration activities, which could include follow-up fires or manual treatments. Invasive plant monitoring will be done as part of the follow-up in accordance with BC Parks Vegetation Management Policy - Management of Ecosystem Processes.



**Figure 8.** View towards area where burn is planned in forest in foreground

### **3.4 Burn Planning**

A burn plan is being developed in conjunction with the BC Ministry of Forests and Range – Northwest Fire Centre. The area covered by the burn plan is 4.04 ha. Not all of this area is likely to burn as the area includes a stream zone that may be too moist to burn, and burning is not planned for riparian areas (Figure 9). There are natural firebreaks on the landscape. Upslope the terrain levels off and the understory vegetation is not fire prone. Any burning would be done early in the season before green-up, when these up-slope areas would have low fire risk.



**Figure 9.** Orthophoto showing proposed burn area and monitoring plot

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## **Appendix 1: Vegetation Management Prescription**

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### **Location**

- Uncha Mountain Red Hills Provincial Park – Red Hills Portion. 1 km east of the western boundary of the Red Hills portion of the park.
- UTM 10U 329749 5991100
- Mapsheet: 93K.022 and 93K.003

### **Site Description**

- SBSdk1 site series 81, Atki, Atss
- Total area: 4.0 hectares
- Soil Moisture Regime: 2-3 (1, 4)
- Soil Nutrient Regime: C (D)
- Elevation: 740 – 860 metres
- Slope Position: mid to upper
- Slope: 50%

### **Stand description**

The vegetation of the Red Hills has undergone a major change in the last 60 years, with woody vegetation, dominated by trembling aspen, now occupying areas that were previously open grassland (de Groot and Armitage 2007). The major shrub species were kinnikinnick and Saskatoon, with minor amounts of prickly rose, spirea, common juniper, willow and snowberry. Aspen is the dominant tree cover in the burn area, with minor amounts of lodgepole pine, Interior spruce and birch (Table 1); the trees were generally small diameter. There were few non-native species in the area. Plant species diversity is higher in the SBSdk/81 than any other site series in the SBSdk, with many species with low cover values. This makes it difficult to predict which species will respond to fire treatments, so targets are presented for growth forms.

### **Restoration Prescription**

Use prescribed fire to kill aspen trees and other woody plant species. Follow-up treatments, including burns and perhaps manual treatments, will likely be required to control aspen suckers.

### **Management Objectives**

- 1) To reduce the cover of woody plant species, especially aspen, and increase the cover of forbs and graminoids.
- 2) To assess the effectiveness of burning as a treatment for controlling aspen encroachment on SBSdk/81 grasslands.

### **Target Burn Conditions**

The effect of burning severity on the number of suckers produced by aspen is not clear. AMEC (2002) report that light burns produce fewer suckers than moderate to severe burns, but this is not supported by Wang (2003) who found that sucker production decreased as burn severity increased. Wang (2003) found that regardless of burn severity, after three years the number of suckers was similar due to the death of many suckers, but the suckers were larger and thicker on most lightly burnt sites. Hotter fires are more likely to kill aspen roots on shallow soil sites (Howard 1996). This is corroborated by local experience (Veenstra and Haeussler 2002). So a hotter fire is desired, as this is most likely to kill aspen. The details of burn conditions will be contained in the Burn Plan.

### **Target Vegetation Conditions**

- Reduction of aspen cover – minimum mortality of 30% of aspen trees in the burnt area, but more mortality is better
- No increase in non-native species
- Decrease in ratio of woody species relative to herbaceous species
- Increase in % cover of native graminoids such as slender wheatgrass and spreading needlegrass
- Increase in % cover of forb species such as purple peavine, showy aster and northern bedstraw
- Low levels of aspen suckering after burning

### **Relevant Plans**

- Lakes Land and Resource Management Plan
- Uncha Mountain Red Hills / Francois Lake Provincial Park Management Direction Statement
- Uncha Mountain Red Hills Park: Vegetation Management in a Post-mountain Pine Beetle Landscape (de Groot and Armitage 2007)

### **Wildlife – Habitat – Biodiversity Objectives**

1. Restore grasslands through reducing encroachment of aspen onto formerly more open grassland area
2. Increase habitat suitable to wildlife species that prefer open vegetation types such as garter snakes

### **Watershed Objectives**

There is a small stream, which is not known to support fish, running through the burn area. Areas adjacent to the stream are not targeted for burning. Fuels near the stream will be moister at the time of burning, thus less likely to burn. The objective will be to have no negative impact on water quality.

### **Range**

The area is part of Range Unit Plan RAN075790. Cattle usage of the area will be minimal due to the steep terrain. The range licensee is Charles and Sheralynn Peebles.

### **Visual Quality**

The area is only visible from boats on Francois Lake. The blackened trees and ground will be visible from the lake but the impact will be minimal. Smoke from the burn will have a short-term visual impact. Smoke management is addressed in the burn plan.

### **Recreation**

There is a hiking trail at the downhill edge of the burn area. The fire will not cross the trail. The trail is not heavily used and the burn will not affect recreational opportunities in the park.

### **Cultural Values**

There are no known cultural or archaeological sites in the area. The Office of the Wet'suwet'en has indicated that burning in the park is consistent with traditional vegetation management practices.

### **Monitoring and Long-term Planning**

A monitoring plot containing Daubenmire plots and transects has been established in the area. The planned burn covers part of the monitoring plot, with the unburned portion being used as a control. These plots will be remeasured following any treatments. This monitoring information will be used to measure the success of the prescribed fire and to plan future treatments. Future treatments may include burning and/or manual treatments. These treatments may be required to address suckering, which often occurs following burning. Additionally, burn severity will be recorded post-burn. Aspen mortality and vegetation response will be recorded by burn severity. This information, along with fire climatology information collected by the Northwest Fire Centre, will allow the fire to be used as a learning opportunity.

## Prescription Approval

Prepared by:  Signature Adrian de Groot Printed name	Date	Reviewed by: (Ministry official)  Signature	Date
Final Approval (Signature)		Date	

## **Appendix 2: Prescribed Fire Burn Plan**

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	YEAR 1	YEAR 2	YEAR 3
Registration Number:	R08R0039		
Client Number:	22718		

**FIRE COMPLEXITY RATING: 49**

**Submitted by:**

Company or Agency & Applicant Name: Ministry of Environment Bag 5000 3726 Alfred Ave Smithers BC V0J 2N0		Date:	Apr. 30, 08
Signature:		Certification Level:	

**Reviewed by:** (may have more than one reviewer)

**REVIEWER MUST BE QUALIFIED ACCORDING TO THE COMPLEXITY RATING OF THIS FIRE.**

Name:	Ian Meier	Date:	Apr. 30, 08
Signature:		Certification Level:	

**PRESCRIBED FIRE BURN PLAN APPROVED:**

**Designated Forest Official – Protection**

Name:	Rob Krause	Date:	Apr. 30, 08
Signature:		Certification Level:	

**EXTENSION APPROVED:**

YEAR 2	Name:		Date:	
	Signature:		Certification Level:	
YEAR 3	Name:		Date:	
	Signature:		Certification Level:	

**AUTHORIZATION TO CONDUCT THE PRESCRIBED BURN ON THE SITE MUST BE ACQUIRED FROM THE LAND MANAGER PRIOR TO SUBMITTING THE BURN PLAN.**

**THIS BURN PLAN DOES NOT PROVIDE FOR APPROVAL UNDER THE ENVIRONMENTAL MANAGEMENT ACT, OPEN BURNING SMOKE CONTROL REGULATION**

For help with this form, please visit our web site:



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## PRESCRIBED FIRE BURN PLAN

Online help at <http://www.for.gov.bc.ca/protect/burning/BurnPlanHelp.htm>



TABLE OF CONTENTS/BURN PLAN CHECKLIST

Complete <input checked="" type="checkbox"/> or N/A	Section and Title
	Cover Sheet
	Table of Contents (this page)
	A. Project Overview
	B. Fuel/Stand Description
	C. Prescribed Burn Objectives and Desired Fire Effects
	D. Values at Risk
	E. Public Relations and Information Strategy
	F. Prescribed Burn Operations
	G. Prescribed Burn Budget Estimates (if required)
	H. Monitoring and Documentation

Attached Schedules

	1. Stand/Fuels Description Map (if required)
	2. Prescribed Fire Complexity Worksheet & Rating Guide (mandatory)
	3. Organization Chart (if required)
	4. On Site Communications Plan (if required)
	5. Medical Operations Plan (if required)
	6. Safe Work Procedures (if required)
	7. Information Plan – Notification Checklist (if required)
	8. Information Plan – Public Notice (if required)
	Information Plan - Public Notice – Radio Station (if required)
	9. Traffic Plan (if required)
	10. Security Plan (if required)
	11. Prescribed Fire “Go-No-Go” Checklist (mandatory)
	12. Burn Plan Map (mandatory)



**A. Project Overview**

Location:

Geographic Location	Red Hills	Lat/Long	54 02 30 , 125 36 00
Base Map/Opening	93K.002 and .003/423	Forest Region	NI
Fire Centre	Northwest	District	Nadina
Zone	Nadina	TSA	

Legal:

Land Status	Uncha Mountain Red Hills Provincial Park	Tenure /Licence	Provincial Park
Licencee/Owner	Ministry of Environment	Phone Number (24hr.)	847-7658 / 847-5640
Land Description	Park # 9866	Plan Number	

Information:

Burning Supervisor	Rob Krause	Phone Number (24hr.)	692-2200
Size	4 ha	Photo Line Number	

General Description:

This burn is planned for the spring of 2008 with the month of April being the most likely burning window. The timing will be after moisture levels have dropped on the south-facing slopes but before green-up occurs. The timing window will be relatively short. The main objective of the burn is to kill woody species, especially aspen, that have been encroaching on grassland areas in the park, thus restoring the grasslands. The burn area is about 1 km east of the closest residences and private land. Downslope is Francois Lake and upslope is coniferous forest with a mossy forest floor. The conifers start where there is slope break to a shallow slope, and snow persists much longer than in the target burn area. The fuels in the burn area are mostly fine fuels produced by grasses, herbs and small shrubs.

The Wetsu'weten First Nation have indicated that burning in this area is in line with traditional practices.

**B. Fuel /Stand Description**

1) Biogeoclimatic Subzone	SBSdk
2) Site Series	82
3) FBP Fuel Type	D-1, leafless aspen
4) Forest Cover	Aspen forest
5) Slope	Slope is appoximately 50%. A major draw splits the area into 2 sections.



6) Aspect	South
7) Elevation	800 m
8) Slope Position	Upper - Mid
9) Valley Orientation	East - West
10) Duff Depth	
11) Soil Texture (predominant)	Sandy Loam to loam
12) Fuel Loading	

Additional Comments:

**C. Prescribed Burn Objectives and Desired Fire Effects**

Summary

The intent of this fire is to restore grasslands that have been encroached upon by aspen. This will kill the aspen trees and other woody species. Follow-up burns will be needed once the level of aspen kill has been determined.

Weather

Ideally, the weather will clear and sunny to maximize warming of the fuel on the south facing slope. The temperature can be cooler (5-15 degrees celcius), but the relative humidity needs to be less than 30%. The preferred winds will be out of the south at 5 to 10 kilometers per hour (kph). Maximum winds speeds should be 20 kph. Due to the 50% slopes throughout this plot the slope equivalent wind speed is 21 kph which is why light winds are desirable.

The closest and most representative weather station is the Grassy Plains station. The Fire Behaviour Specialist outlined in the Organization Chart will monitor the weather as well as the fire weather indices/ codes. When the prescribed burning conditions have been met, completion of the GO-NO GO list will occur.

Fire Weather Indices/Codes

FFMC 86/87 Slope Adjusted FFMC 89-90

ISI 15

Fuel Moisture Content

The grass component needs to be greater than 80% cured as this is the fuel that will carry the fire

Fire Behaviour to Meet Desired Fire Effects

A fire intensity class 3 is the preferred fire behaviour in order to kill the aspen in the burn plot. Current research is not definitive on what fire intensity is the most effective at killing aspen. This



means the post fire monitoring that is proposed is essential to determine the appropriate fire intensity class for future burns on this site.

Smoke Management

The Nadina Forest District Burn Management Plan will be reviewed prior to burning to ensure the burn complies with the plan. This plan can be viewed at the following link:

<http://cleanairplan.ca/pdf/fhdb/NadinaBurnPlan2005.pdf>

A custom venting forecast will be requested for the burn site the morning of the burn. This will be supplied by the Ministry of Environment, Environmental Protection Division in Smithers.

**D. Values at Risk**

Threatened Areas (outside the burn area)

There is no public infrastructure near the burn site. Conifer stands up hill from the burn area will need to be protected. An early spring burn will ensure the fire doesn't spread outside the target area. The park boundary is 900 - 1,000 meters to the north, 1,000 meters to the west, and 2,200 meters to the east from the burn plot. If the burn travels outside of the 4 hectare plot, suppression activities will commence immediately. However, the fire will not be considered a wildfire as long as it is within the park boundaries.

Areas to be Protected (inside the burn area)

Rocky mountain juniper occurs in the general area; if any occur in the burn area measures to protect them should be taken, such as raking fuels away for the base of the tree.

**E. Public Relations and Information Strategy**

Local residents are interested in the area and wish to be informed of any activities. This includes the local fire departments. The Ministry of Environment will contact the necessary news outlets and the local residents.

**F. Prescribed Burn Operations**

Pre-Burn preparations

Ignition and Control Plan

If the fire is threatening to escape the area of intended burn, then the Type 1 resources that will be onsite will respond immediately.

Fire Suppression Resources at Burn Area for Ignition and Control

The resources that will be onsite for the ignition and control will be sufficient in numbers in order to successfully carry out ignition and contain any escapes. If required further resources will be



requested through the Burns Lake Fire Zone.

Adult Persons	Hand Tools	Pumps	Hose	Heavy Equipment	Other
12	12	4	5,000 feet	N/A	

Mopup and Patrol Objectives

(All fires will be extinguished 1 days after ignition.)

Adult Persons	Hand Tools	Pumps	Hose	Heavy Equipment	Other
12	12	4	5,000 feet	N/A	

**(total resources to be available and required for mop-up and patrol for Day 2 and onward)**

Patrol Plan

Escape Fire Contingency Plan

Chance of escape on this burn is very low. If however, the prescribed burn escapes from the intended area of burn, an area of acceptable loss has been identified on the burn map. As long as the burn remains inside the park boundaries, these losses are acceptable.

Total Resources Required in Event of a Fire Escape

The Operations Chief will determine the required resources when needed.

Adult Persons	Hand Tools	Pumps	Hose	Heavy Equipment	Other

**G. Prescribed Burn Budget Estimates** (if required)

Ignition Crew: inkind support from Nadina Fire Zone.

Mop-up and Patrol Crew: inkind support from Nadina Fire Zone.

Ignition Supplies: Burn fuel

Fire equipment: inkind support from the Nadina Fire Zone

Post fire monitoring: Funding for post-fire monitoring has been secured through a contract to Adrian de Groot from the Bulkley Valley Research Centre, and through funding supplied to Sybille Haeussler from the Habitat Conservation Trust Fund.

**H. Monitoring**

Monitoring



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## PRESCRIBED FIRE BURN PLAN

Vegetation monitoring plots have been established in part of the burn area to measure the outcomes of the fire. Funds have been secured to remeasure these plots following the fire, and to measure the fire intensity over the entire burn area, and aspen mortality rate over the burn area.

### Documentation

Details on the pre-fire vegetation and on the plans for post-fire monitoring can be found in the report - de Groot, A. 2008. Uncha Mountains Red Hills Provincial Park Grasslands Description and Restoration. Bulkley Valley Centre for Natural Resource Research and Management, Smithers, BC.





## **SCHEDULES**

### **Schedule 1. STAND/FUELS DESCRIPTION MAP (if required)**

The area of intended burn is predominantly aspen overstory

#### Comments

Details of the vegetation in the area can be found in the report: de Groot, A. 2008. Uncha Mountains Red Hills Provincial Park Grasslands Description and Restoration. Bulkley Valley Centre for Natural Resource Research and Management, Smithers, BC.



Schedule 2 – Prescribed Fire Complexity Worksheet and Rating Guide (mandatory)

Complexity Element	Weighting Factor	Complexity Factor	Total Value
Safety	5	1 - Easy	5
Threats to Boundaries	5	1 - Easy	5
Fire Behaviour	5	2 - Moderate	10
Objectives	4	2 - Moderate	8
Size of Burn Organization	4	1 - Easy	4
Improvements within or Adjacent to Burn Area	3	1 - Easy	3
Environmental/Timber/Cultural or Social Values	3	1 - Easy	3
Air Quality Values/Issues	3	1 - Easy	3
Logistic Considerations	3	1 - Easy	3
Political Considerations	2	1 - Easy	2
Tactical Operations	2	1 - Easy	2
Multiagency Involvement	1	1 - Easy	1
<b>Project Total</b>			<b>49</b>

Type III Burn Boss Required for Projects with Rating of 40 – 51

Type II Burn Boss Required for Projects with Rating of 52 - 84

Type I Burn Boss Required for Projects with Rating of >84

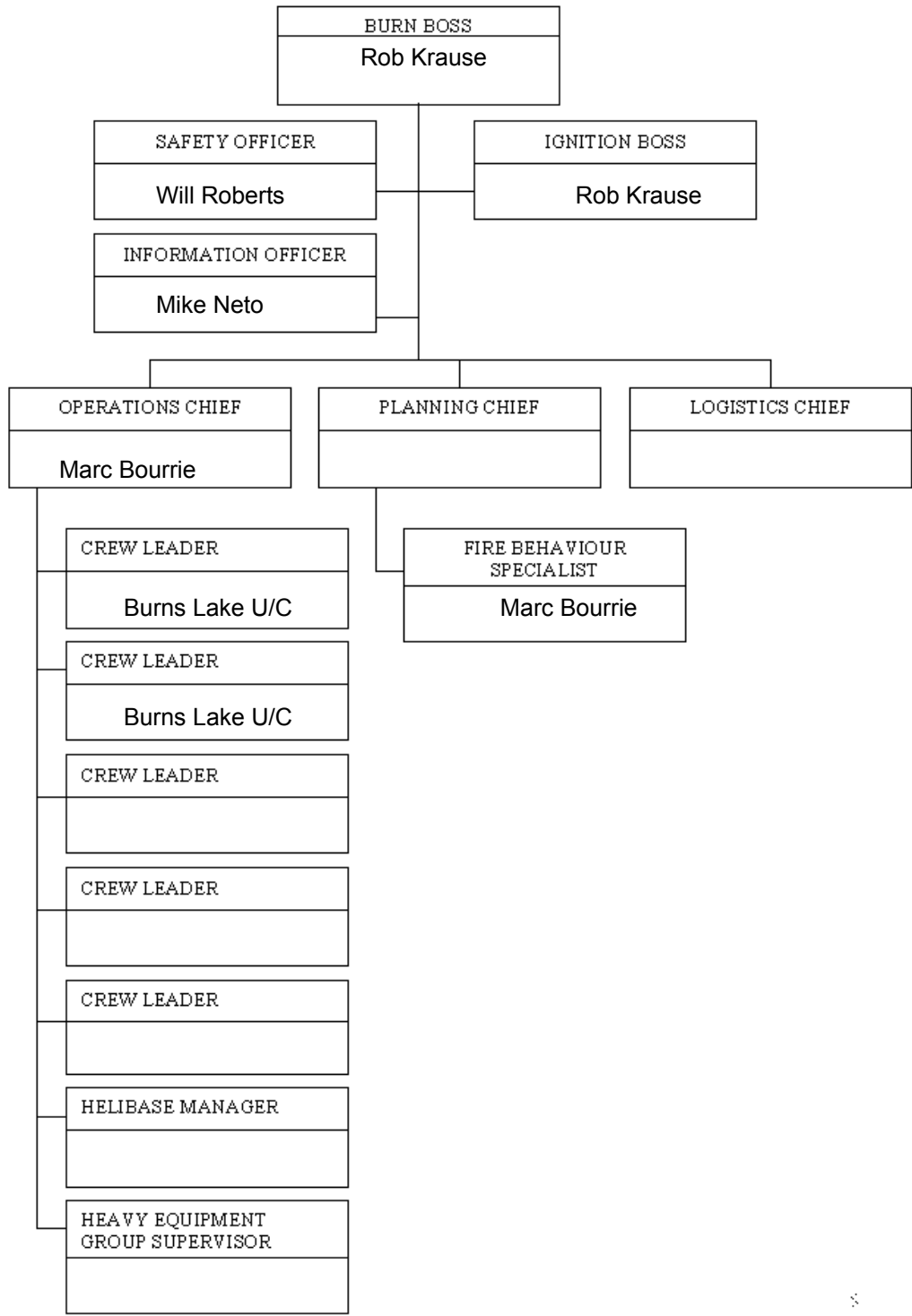
The Prescribed Fire Complexity Analysis provides a method to assess the complexity of the Planned prescribed fire project. The analysis incorporates an assigned numeric rating complexity value for specific complexity elements that are weighted in their contribution to overall complexity. The weighted value is multiplied by the numeric rating value to provide a total value for that element. All elements are then "added to generate the total project complexity value. Breakpoint values are provided for low & moderate and high complexity elements." This complexity worksheet is accompanied (on the Prescribed Fire web site - click the button below) by a guide to numeric values for each complexity element shown.

**Guide to Numeric Values at**

<http://www.for.gov.bc.ca/protect/burnplan/BurnPlanHelp.htm#wshelp>



Schedule 3 - Organization Chart (if required)





**Schedule 4 – On Site Communications Plan** (if required)

Gray repeater tone 5 - F2- contact firecentre, incoming resource, medical evacuations.

Gold-F1- on site communications between crews.

**Schedule 5 – Medical Operations Plan** (if required)

**Gray repeater tone 5 - F2- medical evacuations.**

**1 ETV and 1 Level III First Aid Attendant will be on site.**

**Schedule 6 – Safe Work Procedures** (if required)

A thorough tailgate safety briefing will be conducted prior to the commencement of ignition.

**Schedule 7 – Notification Checklist** (if required)

(use ctrl + tab to move to next column)

Contact	Notified	Telephone	Fax
Bryan Matthews, local landowner: 251 0052 cell, 692 7053 work, 692 6108 home			
Jan Owens, Southside Volunteer Fire Dept: 694 3270, 694 3577 home, 694 3553			
Bruce Hutchinson, local landowner 847-7233 home, 847-7207 work			
Office of the Wet'suwet'en, David De Wit 847-3630			

**Schedule 8 – Public Notice** (if required)

Interested local residents have been contacted by phone regarding this burn. PAB has advised that personal communication with stakeholders is the most appropriate communication for this burn.

**Public Notice – Radio Station** (if required)

Not required - PAB has advised that a burn this size does not warrant radio notice.



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## PRESCRIBED FIRE BURN PLAN

### **Schedule 9 – Traffic Plan** (if required)

Not required - there are no roads adjacent to the burn site.

### **Schedule 10 – Security Plan** (if required)

Signs will be posted by the Information Officer at the trail head entering the Red Hills Park notifying any hikers of the work that is in progress.



Schedule 11 – GO NO-GO CHECKLIST (mandatory)

A 'NO' RESPONSE TO ANY ITEM MEANS STOP!

Project Name Red Hills Burn	Burn Boss Rob Krause
--------------------------------	-------------------------

Checklist Item:	YES	NO
1. Is burn plan complete and approved?	<input type="checkbox"/>	<input type="checkbox"/>
2. Are <b>all</b> fire prescription specifications met? (fire weather indices / site conditions)	<input type="checkbox"/>	<input type="checkbox"/>
3. Are <b>all</b> smoke management prescription specifications and requirements met? Has the public information and communications plan been fully implemented?	<input type="checkbox"/>	<input type="checkbox"/>
4. Is the current and projected fire weather forecast favourable?	<input type="checkbox"/>	<input type="checkbox"/>
5. Are <b>all</b> personnel, required in the prescribed burn plan, on site and qualified for assigned positions?	<input type="checkbox"/>	<input type="checkbox"/>
6. Have <b>all</b> personnel been briefed on the prescribed burn plan requirements?	<input type="checkbox"/>	<input type="checkbox"/>
7. Have <b>all</b> personnel been briefed on the project safety plan, including known hazards, and L.C.E.S. (Lookouts, Communications, Escape Routes, and Safety Zones)?	<input type="checkbox"/>	<input type="checkbox"/>
8. Is <b>all</b> the required equipment in place and in working order?	<input type="checkbox"/>	<input type="checkbox"/>
9. Are available resources including backup, adequate for containment of potential escapes? Are the assigned resources in place?	<input type="checkbox"/>	<input type="checkbox"/>
10. Is the test burn adequate for assessing the burn's potential?	<input type="checkbox"/>	<input type="checkbox"/>
11. In your opinion, can the burn be carried out according to plan and will it meet the planning objectives?	<input type="checkbox"/>	<input type="checkbox"/>
12. Is there an adequate contingency plan developed? Has it been communicated to assigned supervisors?	<input type="checkbox"/>	<input type="checkbox"/>
13. Have notifications been completed?	<input type="checkbox"/>	<input type="checkbox"/>



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## PRESCRIBED FIRE BURN PLAN

### **Schedule 12 – Burn Plan Map** (mandatory)

Attach map to printed copy.

Comments